

## INTISARI

Stroberi (*Fragaria vesca* L.) adalah buah yang bermanfaat bagi kesehatan karena kandungan antioksidan yaitu : asam askorbat, komponen polifenol, *quercetin-3-β-D-glucoside*, *Coenzym Q<sub>10</sub>*, serta antosianin *pelargonidin-3-O-glucoside* dan *cyanidin-3-glucoside*. Jumlah antosianin dan flavonoid dalam buah stroberi selama proses perlakuan akan mengalami penurunan masing-masing 53% untuk kandungan *pelargonidin-3-O-glucoside* dan 40% untuk kandungan flavonoid kuersetin. Bentuk sediaan emulsi a/m (air/minyak) merupakan sistem yang menjanjikan untuk digunakan secara topikal, namun penggunaan emulsi a/m secara topikal kurang nyaman, sehingga perlu didispersikan dalam matrik gel agar memudahkan dalam aplikasinya dan dapat membantu daya permeasi komponen aktif jus buah stroberi ke dalam stratum korneum. Emulsi terdiri dari komponen air dan minyak yang tidak saling bercampur, sehingga membutuhkan bahan tambahan yang disebut emulgator untuk membuat suatu sistem yang homogen dan stabil.

Emulgator yang digunakan pada penelitian ini adalah span 80, croduret 50, dan propilen glikol. Perlu dilakukan optimasi kombinasi emulgator tersebut untuk mendapatkan proporsi komposisi yang tepat, sehingga menghasilkan formula optimum dengan stabilitas fisik yang baik, mampu menstabilkan kandungan aktif, serta dapat mentranspor kandungan aktif melewati membran. Metode optimasi yang digunakan adalah *Simplex Lattice Design* dengan *software Design Expert<sup>®</sup> 7.1.5*. Respon dari parameter fisik yang dinilai adalah viskositas, rasio pemisahan (F), dan diameter globul emulsi. Formula optimum dilakukan uji stabilitas fisik, kandungan aktif kuersetin dan antosianin, selanjutnya akan diuji transpor melewati membran *shed snake skin* menggunakan alat sel difusi model Franz dengan parameter kadar kuersetin yang mampu melewati membran.

Sediaan emulsi yang stabil secara fisik, ditinjau dari hasil uji memiliki perbedaan yang tidak signifikan terhadap hasil prediksi *Simplex Lattice Desain* (*p-value* > 0,05) pada proporsi komposisi span 80-croduret 50-propilen glikol pada perbandingan 2% : 4% : 2%. Aktivitas antioksidan jus buah stroberi kering sebesar 331,26 µg/mL, kadar kuersetin dan antosianin jus buah stroberi kering masing-masing 23,3% dan 13,23%. Kadar flavonoid dan antosianin formula optimum emulgel jus buah stroberi kering setelah 28 hari masing-masing sebesar 1,8% dan 30,67%. Kadar flavonoid pada penyimpanan suhu 4±2°C dan 45±2°C masing-masing 1,3% dan 1,05%. Jumlah kumulatif flavonoid yang tertranspor melewati membran *shed snake skin* sebesar 117,14 µg/cm<sup>2</sup> dari total 10 mg jus buah stroberi kering dalam formula optimum sediaan emulgel selama 5 jam. Permeabilitas membran *shed snake skin* adalah 2,84x10<sup>-5</sup> µg/cm<sup>2</sup> dan nilai flux 6,6x10<sup>-5</sup> µg/detik.

**Kata kunci :** jus buah stroberi kering, emulgator, *Simplex Lattice Design*, emulgel, kuersetin

## ABSTRACT

Strawberry (*Fragaria vesca* L.) contains many nutrients that are beneficial to health because rich of antioxidant such as ascorbic acid, component of polyphenols, quercetin-3- $\beta$ -D-glucoside, coenzymes Q<sub>10</sub> as well as anthocyanin pelargonidin-3-O-glucoside and cyanidin-3-glucoside. Amount of anthocyanins and flavonoids in strawberry during process will decline respectively 53% for pelargonidin-3-O-glucoside and 40% for flavonoid quercetin. Water-oil emulsion (w/o) is a system that promises to be used topically, but using w/o emulsion topically less convenient, so it needs to be dispersed in the matrix gel in order to facilitate the application and to help sustain the permeation of the active components of strawberry juice into the stratum corneum. Emulsion consisting of water and oil components are not mixed with each other, thus requiring additional materials called emulsifier to create a system that is homogeneous and stable.

Formulation of water-oil emulsion requires a combination emulsifier to consolidate of water and oil phase. Emulsifier as span 80, croduret 50, propylene glycol are optimized, to know their combination in order to gain each portion of components which will produce an optimum formula with good physical stability, stabilize the active ingredient, and pass through the membrane. The optimization method was *Simplex Lattice Design* by *Design Expert*<sup>®</sup> software 7.1.5. The results of the response of the assessed physical parameter were viscosity, separation ratio (F), and diameter of emulsion globule. The optimum formula have measured physical stability test, active ingredient of flavonoid and anthocyanins, which then was conducted transport test through the membrane of shed snake skin by Franz's model diffusion cells with the flavonoid concentration parameters that were able to pass through the membrane.

Emulsion w/o that use combination of 2% Span80, 4% croduret 50, and 2% propylene glycol which produce a physically stable emulsion with the test results had no significant difference to the prediction results of *Simplex Lattice Design* (p-value > 0.05). Dry strawberry juice contains 23,3 % of flavonoid, 13,23% of anthocyanin, and 331  $\mu\text{g/mL}$  antioxidant activity. The emulgel optimum formula level of flavonoid after 28 days was 1,8% and anthocyanin level was 30.67%. Flavonoid level of emulgel optimum formula of dry strawberry juice in storage temperature  $4\pm 2^\circ\text{C}$  and  $45\pm 2^\circ\text{C}$ , average 1,3% and 1,05%. The cumulative amount of flavonoid which was transported through the shed snake skin membrane was 117,14  $\mu\text{g/cm}^2$  out of 10 mg of dry strawberry juice during five hours. The permeability of membrane shed snake skins is  $2,84\times 10^{-5}$   $\mu\text{g/cm}^2$  and flux value is  $6,6\times 10^{-5}$   $\mu\text{g/secon}$ .

**Keywords:** dry strawberry juice, emulsifier, *Simplex Lattice Design*, emulgel, flavonoid.